

Name \_\_\_\_\_

### GENETICS PRACTICE

Read carefully and follow all directions.

1. Use the following key regarding traits in pea plants to write genotypes and phenotypes:

- Round seed shape (R) is dominant over wrinkled seed shape (r)
- Green pod color (G) is dominant over yellow pod color (g)

A) Write the genotype of the following:

- |  |                |
|--|----------------|
| 1. Heterozygous round                      | 1. <b>Rr</b>   |
| 2. Wrinkled                                | 2. <b>rr</b>   |
| 3. Homozygous round and heterozygous green | 3. <b>RRGg</b> |
| 4. Yellow                                  | 4. <b>gg</b>   |
| 5. Wrinkled and homozygous green           | 5. <b>rrGG</b> |

B) Write the phenotype for the following:

- |          |                              |
|----------|------------------------------|
| 1. RR Gg | 1. <b>round and green</b>    |
| 2. gg    | 2. <b>yellow</b>             |
| 3. rr    | 3. <b>wrinkled</b>           |
| 4. rr GG | 4. <b>wrinkled and green</b> |
| 5. Rr gg | 5. <b>round and yellow</b>   |

For problems 2-4, do each of the following:

- Write the genetic cross for the parents (ex- Bb x bb).
- Show the work in a Punnett Square.
- Determine the genotypic and phenotypic ratios.
- Determine the probability that the offspring would have the indicated genotypes and/or phenotypes.

2. In pea plants, tall (T) is dominant over short (t).

Cross two heterozygous tall plants.

♂ **Tt** X **Tt** ♀

	<b>T</b>	<b>t</b>
<b>T</b>	<b>TT</b>	<b>Tt</b>
<b>t</b>	<b>Tt</b>	<b>tt</b>

GENOTYPIC RATIO: 1 **TT**: 2 **Tt**: 1 **tt**

PHENOTYPIC RATIO: 3 **tall** : 1 **short**

Probability offspring has genotype TT: **1/4**

Probability offspring has genotype Tt: **2/4 = 1/2**

Probability offspring has genotype tt: **1/4**

Probability offspring is tall: **3/4**

Probability offspring is short: **1/4**

3. In pea plants, round seeds (R) are dominant over wrinkled (r).

Cross each of the following:

- (a) homozygous round seeds x wrinkled seeds
- (b) two plants that are heterozygous for round seeds
- (c) heterozygous round seeds x wrinkled seeds

a. ♂ RR X rr ♀

	r	r
R	Rr	Rr
R	Rr	Rr

Genotypic ratio:

100% Rr

Phenotypic ratio:

100% Round

Probability offspring has round seeds: 100%

b. ♂ Rr X Rr ♀

	R	r
R	RR	Rr
r	Rr	rr

Genotypic ratio:

1 RR: 2 Rr: 1 rr

Phenotypic ratio:

3 round : 1 wrinkled

Probability offspring has wrinkled seeds: 1/4

c. ♂ Rr X rr ♀

	r	r
R	Rr	Rr
r	rr	rr

Genotypic ratio:

1 Rr: 1 rr

Phenotypic ratio:

1 round : 1 wrinkled

Probability offspring round seeds: 1/2

4. In pea plants, green colored pods (G) are dominant over yellow pods (g).

Cross each of the following:

- (a) heterozygous green pods x yellow pods
- (b) two plants with yellow pods
- (c) homozygous green pods x heterozygous green pods

a. ♂ Gg X gg ♀

	g	g
G	Gg	Gg
g	gg	gg

Genotypic ratio:

1 Gg: 1 gg

Phenotypic ratio:

1 green : 1 yellow

Probability offspring has genotype Gg: 1/2

b. ♂ gg X gg ♀

	g	g
g	gg	gg
g	gg	gg

Genotypic ratio:

100% gg

Phenotypic ratio:

100% yellow

Probability offspring has genotype gg: 100%

c. ♂ GG X Gg ♀

	G	g
G	GG	Gg
G	GG	Gg

Genotypic ratio:

1 GG : 1 Gg

Phenotypic ratio:

100% green

Probability offspring genotype GG: 1/2

5. We want to know if a certain tall male pea plant is homozygous or heterozygous. Therefore, it is crossed with a female short plant. This is called a test cross.

The resulting phenotype ratio is 1 tall: 1 short.

Homozygous tall male **TT** X

Short female **tt**

	<b>t</b>	<b>t</b>	
<b>T</b>	<b>Tt</b>	<b>Tt</b>	Genotypic ratio: <b>100% Tt</b>  Phenotypic ratio: <b>100% tall</b>
<b>T</b>	<b>Tt</b>	<b>Tt</b>	

Heterozygous tall male **Tt** X

Short female **tt**

	<b>t</b>	<b>t</b>	
<b>T</b>	<b>Tt</b>	<b>Tt</b>	Genotypic ratio: <b>1 Tt : 1 tt</b>  Phenotypic ratio: <b>1 tall : 1 short</b>
<b>t</b>	<b>tt</b>	<b>tt</b>	

What is the tall male plant's genotype? **Tt**

6. We want to know if a certain tall female pea plant is homozygous or heterozygous. Therefore, it is crossed with a male short plant. (Again, this is called a test cross.)

This time the resulting phenotype ratio is 100% tall.

Short male **tt** X

Homozygous tall female **TT**

	<b>T</b>	<b>T</b>	
<b>t</b>	<b>Tt</b>	<b>Tt</b>	Genotypic ratio: <b>100% Tt</b>  Phenotypic ratio: <b>100% tall</b>
<b>t</b>	<b>Tt</b>	<b>Tt</b>	

Short male **tt** X

Heterozygous tall female **Tt**

	<b>T</b>	<b>t</b>	
<b>t</b>	<b>Tt</b>	<b>tt</b>	Genotypic ratio: <b>1 Tt : 1 tt</b>  Phenotypic ratio: <b>1 tall : 1 short</b>
<b>t</b>	<b>Tt</b>	<b>tt</b>	

What is the tall female plant's genotype? **TT**

7. Axial flower position (A) is dominant over terminal flower position (a).

Two pea plants with axial flowers are crossed.

3/4 of the resulting offspring have axial flowers and 1/4 have terminal flowers.

What are the genotypes of the parents? Prove your answer with a Punnett square.

	<b>A</b>	<b>a</b>	
<b>A</b>	<b>AA</b>	<b>Aa</b>	<b>Aa x Aa</b>
<b>a</b>	<b>Aa</b>	<b>aa</b>	